of anatomy were numerous and valuable. His first, a monograph on the myology of the pelvic floor (1899), was in one sense his greatest. Not only does it give evidence of most painstaking, laborious, and exact work, but it sheds much light on one of the most complex myological problems to be found in the human body. At the instigation of Prof. (now Sir George) Thane, he spent the summer of 1906 in Prof. Wiedersheim's laboratory at the Anatomical Institute of the University of Freiburg, where he studied wax plate reconstruction under Prof. Keibel. Peter Thompson must be regarded as one of the pioneers in this country of wax plate reconstruction as applied to the human embryo, and his description of a 2·5 mm. human embryo of twenty-three paired somites, published in 1907, is now a classic. His whole-hearted enthusiasm and devotion to the new method of investigation infected not only his pupils, but also many colleagues and friends, much subsequent embryological work in this country being due primarily to his example and investigation. He was a most valued and assiduous member of the Anatomical Society of Great Britain and Ireland, serving in turn as secretary, treasurer, and vice-president, and contributing largely to its communications and discussions.

Prof. Thompson had the great gift of human sympathy in a wonderful degree, always took the keenest interest in the activities of others, and was greatly beloved by pupils and colleagues alike. His happy spirit and optimism never failed him even during the many dark days of illness, and his memory will be held precious by all who knew him.

WE regret to announce the death in Montreal on October 25 of SIR JOHN KENNEDY, consulting engineer of the Montreal Harbour Commissioners. From an account of his career which appears in the *Engineer* for November 11 it appears that he became blind in 1907, and at the time of his death he had reached the age of eighty-three years. The Institution of Civil Engineers elected him a member, and for some time he acted as a member of council. He was one of the founders of the Canadian Society of Civil Engineers, of which he was elected president in 1892.

Notes.

ON Thursday, November 24, Field-Marshal Earl Haig, who was accompanied by Lady Haig, unveiled memorials erected to the memory of members of the Institution of Mining and Metallurgy and the Institution of Mining Engineers who fell in the great war. The proceedings were opened by Mr. F. W. Harbord, president of the Institution of Mining and Metallurgy, and Col. W. C. Blackett, past-president of the Institution of Mining Engineers (in the absence of Sir John Cadman, the president). In the course of his address, Earl Haig expressed his satisfaction in having the opportunity to pay a personal tribute to a section of those many thousands of brave men who fought under his command, and to say a few words of special thanks to a body of men whose work in France seldom drew upon itself much notice or glory at the time, but was surpassed by none in the demands it made upon the skill, courage, and resolution of the individuals concerned, or in the service it rendered to the Army as a whole. He then referred in greater detail to the arduous and dangerous work accomplished by the Tunnelling Section of the Royal Engineers at Messines, on the Somme, and in other places, and concluded with an eloquent appeal for those who were left to learn the lessons taught by the men who had given the last full measure of their devotion to the cause they had so worthily upheld. The unveiling of the memorials was followed by a solemn silence of one minute's duration, after which Lord Haig pronounced the words: "Their name liveth for evermore," and the "Last Post" and "Reveille" were sounded. General Sir W. A. Liddell, Director of Fortifications and Works, and other distinguished generals and the officers and councils of the two institutions were present at the unveiling. The memorials are placed in the library at Cleveland House, 225 City Road, E.C.

MR. K. RASMUSSEN's report of the progress of his expedition has reached Copenhagen. According to the *Times*, the expedition's vessel, the *Sea King*, did not reach the projected station at Lyon Inlet, in Melville Peninsula, until September 8, being delayed by heavy pack and engine trouble. A base was established on a small uncharted islet, named Danish Island, off Lyon Inlet. Mr. Rasmussen is well pleased with the situation as a centre for research, and reports plenty of bears, reindeer, and hares in the neighbourhood. Walrus and seals were seen daily in the sound. Ruins of Eskimo dwellings show that Danish Island was formerly inhabited. Mr. Rasmussen hopes to be able to trace the route of migration of the Eskimo through this region. When the report was dispatched he and a companion were setting out to visit the nearest tribes in the countryside, travelling by dog-sledge. The next report may be expected at the end of April, and will be sent *via* Fort Churchill and Winnipeg.

DR. E. N. MILES THOMAS has resigned the keepership of the Department of Botany of the National Museum of Wales.

A DISCUSSION on "Certain Geological Consequences of the Cooling of the Earth" will be held in the rooms of the Royal Astronomical Society on Friday, December 2, at 5 p.m. The chair will be taken by Sir Jethro Teall. Dr. H. Jeffreys will open the discussion, which will be continued by Dr. Jeans, Prof. Lindemann, Dr. Evans, and Col. E. H. Grove-Hills.

THE Royal Society of South Africa has elected the following officers for 1922:—*President:* Dr. J. D. F. Gilchrist. *Hon. Treasurer:* Dr. L. Crawford. *Hon. General Secretary:* Dr. W. A. Jolly. *Members of Council:* Sir Carruthers Beattie, Mr. S. H. Haughton, Mr. S. S. Hough, Dr. C. J. Juritz, Mr. C. P. Lounsbury, Prof. J. T. Morrison, Dr. A. Ogg, Dr. A. W. Rogers, and Dr. R. B. Young.

WE learn from *Science* that Dr. Harlow Shapley, formerly of the Mount Wilson Solar Observatory, has been appointed director of the Harvard College Observatory in succession to the late Edward C. Pickering, and that Dr. Joel Stebbings, director of the Washburn Observatory and professor of astronomy at the University of Wisconsin, is to succeed Prof. G. C. Comstock as director of the observatory in July next.

THE Trustees of the British Museum have decided to open the Natural History Museum to the public every Sunday from 2.30 p.m. to 6 p.m., commencing next Sunday, and on weekdays from 10 a.m. to 5 p.m. in the winter months, October to February, and from 10 a.m. to 6 p.m. in the summer months, March to September. Previously the hours of admission on Sundays have varied with the season of the year. The museum will be closed on Christmas Day.

LT.-COL. H. H. GODWIN-AUSTEN, Nore, Godalming, asks us to make known that a portfolio of his Indian sketches is missing from the rooms of the Royal Geographical Society, Kensington Gore, London, S.W.7, and he hopes that publicity will lead to its recovery. The portfolio is very large and heavy, about 2 ft. 4 in. by 1 ft. 6 in., strongly bound in black cloth. On the outside cover are set out the names of the countries the sketches were made in—Burma, Kashmir, etc.—the lettering cut out in gilt paper and pasted on. The portfolio contains about 160 sketches in water-colour, sepia, and pencil (a few loose), of which there is nearly a complete list made.

AT the meeting of the Sociological Society held on November 22, a lecture on "The Successors of Austria-Hungary: Some of their Problems" was delivered by Dr. R. W. Seton Watson. Mr. G. P. Gooch was in the chair, and his Excellency the Czecho-Slovak Minister was present, as well as representatives of the Rumanian and Jugo-Slav Legations. Dr. Seton Watson said that of all States Austria-Hungary had been the most complex, presenting not only a great diversity of languages and races, but also a peculiar divergence of culture. Its disappearance had been a unique event in history, similar only to the fall of the Roman Empire, caused, however, not by any general action of other States, but by slow political disintegration due to the lack of any underlying and unifying idea. Criticism of the Treaties of St. Germain and Trianon is easy, but clear-cut frontiers on ethnographical lines are unattainable, such is the intermixture of races. A complete political and social transformation is going on in Europe east of a line from Königsberg to Trieste, the chief, if not the only, citadel of reaction being Hungary. The lecturer went on to give a detailed account of the reforms developing in the succession States, paying a special tribute to the achievement of the Czecho-Slovak Government in the assignment of its various types of lands to the small holders and in education. In Jugo-Slavia, and in Rumania too, education is going forward. In all the succession States religion is becoming democratised and obscurantism has disappeared. We have here a vast laboratory of political, economic, and educational experiments.

MR. T. STEVENS, who laid down the hydraulic plant for the Niagara Power Station so long ago as 1887, gave a very interesting lecture on "Hydraulic Power Development" at Faraday House on November 22. He emphasised the fact that the large water-power undertakings at Niagara, Shawinigan Falls, Montana, etc., had all to wait ten or twelve years before they developed a paying load. In London experts had stated recently that we should build large power stations first, and then the load would be sure to come. Speaking as a hydro-electric engineer, he said that all his experience showed that such a procedure would be financially disastrous. He showed a strikingly beautiful photograph of the Shawinigan Falls enveloped in virgin forest and a recent photograph of the falls with not a tree left and surrounded by unlovely factories and houses. The town, however, has a flourishing population of 12,000, who have been attracted by the cheap power available. He also showed beautiful photographs of the Yguazu Falls, on the border line between Brazil and Argentina, which are among the largest falls in the world. Both the Yguazu Falls and the Victoria Falls on the Zambesi are situated in tropical countries, and the power available varies widely during the different seasons of the year. He pointed out that maximum power does not necessarily coincide with the maximum flow. For instance, a small fall near Yguazu had a 90-ft. drop and a good stream of water in the dry season. In the flood season the falls completely disappeared owing to the raising of the level of the lower part of the river. Owing to the great distances from the nearest centres of population of both the Yguazu and the Victoria Falls, he thought it most unlikely that they would attract an industrial population to their neighbourhood.

IN 1910 Major Patton came to the conclusion that the bed-bug is the invertebrate host of the parasite (the Leishman-Donovan body) of kala-azar, a disease of India and other tropical countries. Major Patton adduces further evidence in the *Indian Journal of Medical Research*, vol. 9, 1921, pp. 240, 252, and 255, in proof of this and Mrs. Helen Adie describes intracellular developmental forms of the parasite in the cells of the stomach of the bed-bug.

PROF. RAYMOND PEARL, in a paper in *Science* (vol. 53, p. 120, 1921), shows the exceedingly transitory effect of war, with its accompanying epidemic and other diseases, upon the rate of growth of population. In Vienna, for example, in spite of the distressing conditions which have prevailed there, it is probable that in 1920 the births will have exceeded the deaths. Prof. Pearl concludes that war and devastating epidemics make the merest ephemeral flicker in the steady onward march of population growth.

IN recent papers, Marshall and Vassalls described a method of treatment of sleeping sickness which, they claimed, gives results better than any other (NATURE, vol. 107, p. 540). It consists in giving intra-venously a dose of neo-kharsivan, and afterwards withdrawing blood and injecting the serum into the spinal canal. In a critical review on the subject in the *Tropical Diseases Bull.*, vol. 18, 1921, p. 155, Dr. Warrington Yorke expresses the opinion that the theoretical grounds upon which the treatment is based are probably incorrect, that the treatment is not new, and that the results so far published fail to substantiate the claim that this treatment gives better results than other methods.

THE Ministry of Health has published as No. 9 of the series of Reports on Public Health and Medical Subjects (H.M. Stationery Office, 1921, 3*d.* net) a paper by Dr. J. M. Hamill entitled "Diet in Relation to Normal Nutrition." Dr. Hamill's object was to provide the general public with a straightforward account of the present state of knowledge. The study of nutrition involves a knowledge of highly technical matters, and it is difficult to present even the end results both clearly and truthfully to the mind of an untrained reader. Dr. Hamill has succeeded in combining intelligibility with veracity, and his report should be of great value to those who wish to know more of dietetics than just sufficient to provide material for chatter about vitamins. As so often happens, the daily Press has been responsible for evil as well as good in popular scientific education regarding nutrition. Recent discoveries in connection with accessory food factors have been so striking that the newspaper reader has perhaps rather lost sight of the more prosaic, but not less important, subject of energy values.

THE relationship of climate to disease has received more attention in popular talk, based on impressions and individual experiences, than from the exact inquiries of the medical statistician. There can be few places in this country that have not been at one time or another described as "bad for rheumatism" by some inhabitant. A paper by Dr. Matthew Young (*Journal of Hygiene*, vol. 20, p. 248) on the regional distribution of rheumatic fever is therefore all the more welcome. He shows that it is definitely more common, as judged by fatalities, in the north and west than in the midlands, east, and south of the British Isles, and finds substantial correlations, positive between the death-rate and the mean annual rainfall and negative between the death-rate and the mean annual temperature. The data are plainly open to the criticisms which can be made of any of the mass figures of the Registrar-General, but Dr. Young seems to have made out a strong case for an association between acute rheumatic infection, a high rainfall, and a low temperature. There are many things which show the same difference between the north-west and south-east in this country—*e.g.* many animals and plants, the relative abundance of oats and wheat in cereal crops—and one which is particularly relevant in questions of disease and scarcely susceptible of numerical expression is the general standard of civilisation.

No definite instance of sexual differences in colour among Chelonia appears to have been clearly established. Considerable interest, therefore, attaches to the observations of Mr. S. F. Blake (Proceedings of the United States National Museum, vol. 59) on sixty specimens of the spotted turtle, *Clemmys guttata*, showing that this species possesses colour characters distinctive of each sex. The male has dusky jaws, no mandibular yellow-orange stripe, the throat but sparsely speckled with yellow, a slightly developed supra-auricular streak of yellow, and the crown of the head without spots. The female, on the other hand, has yellow jaws, a well-marked mandibular yellow-orange stripe, the throat densely spotted with yellow, a well-developed supra-auricular streak of yellow, and the crown of the head with several yellow spots. It is of special interest to learn that these sexual differences in colour can be detected clearly in very young specimens only a few weeks old.

THE director (Dr. E. J. Russell) and librarian (Miss Mary S. Aslin) have published "A Catalogue of Journals and Periodicals in the Library of the Rothamsted Experimental Station, Harpenden." The library began to develop in 1913, when the late Lady Gilbert presented the books and journals belonging to Sir Henry Gilbert. These were added to others previously given by Sir John Lawes. Expansion became possible through the support of many individual donors, learned societies, and Departments of Agriculture throughout the world. The library now contains most of the books and journals which the agricultural expert needs to consult. Though the library is not open to the general public, permission to use it for purposes of reference can be obtained on application to the director. The catalogue, which occupies 70 pages, is divided into sections according to subjects, the first and largest section dealing with agriculture, to which 50 pages are devoted. Other sections are devoted to animal husbandry, bacteriology, biology, botany, chemistry, education, entomology, forestry, horticulture and market-gardening, irrigation and reclamation, meteorology, general science, technology, and zoology. A large number of reports on special subjects are included in the catalogue, but no attempt is made to index individual papers contained in the regular journals. Names of authors do not, therefore, appear. The catalogue should be useful to those who are able from time to time to visit Rothamsted and use its library. It should also serve as an excellent guide to those who wish to get together a collection of authoritative reports on agriculture.

THE Kenya Department of Agriculture has published the meteorological records for 1920, the twelfth annual report for the Colony and Protectorate. At the end of the year there were 21 stations observing temperature and rainfall and 180 stations observing only rain, making a total of 201 stations. The report mentions that the principal feature of the year was the abnormal rainfall experienced generally in November and December. Observations of atmospheric pressure are given for Mombasa, Nairobi, and Londiani; the range in the different months is small. Mean daily levels of Victoria Nyanza for morning and afternoon are given throughout the year 1920, and the average levels are given for each month and for the years 1904–20. There is a sheet of diagrams at the end of the report showing the normal rainfall, also the rainfall for 1920 and its difference from the normal, together with curves showing the monthly rainfall and the difference from the average at twenty-four representative stations. Monthly average rainfall tables for 126 stations are given for a number of years, the period varying from twenty-nine years at Mombasa and twenty-six years at Malindi to as short a time as two years at some stations; there are, however, forty-seven stations with observations for ten years and more. The yearly averages range from 95 in. at Meru (Eyembe Mission) to as little as 7·32 in. at the northern frontier (Wajir). The average monthly totals are generally largest in April and May.

IN vol. 22 of the Special Reports on the Mineral Resources of Great Britain, one of the Memoirs of the Geological Survey, Mr. T. Eastwood describes the lead and zinc ores of the Lake District. This district, geologically considered, consists essentially of Cambrian and Ordovician rocks belonging to the Skiddaw and the Borrowdale series, interspersed with a number of igneous intrusions. These rocks are traversed by a number of fissure veins, in many cases accompanied also by faulting, and these veins have given rise to the mining industry here described. The chief gangue mineral is quartz, as might be expected from the character of the country, and galena and zinc blende constitute the minerals of economic value, the former being often rich in silver. The author gives a very full account of the various mines in the district dealt with, which is of great value to the student of British mineral deposits. Unfortunately the district is of no very great economic importance; even in normal times very few of the lodes described are rich enough to form the basis of a steady mining industry. At present, with the prevailing high price of labour, the relatively low prices of the metals extracted, and the high cost and difficulty of transport which further handicap most of them, none of these mines can be worked without loss.

THE "Madruckverfahren," or machine-pressure process, is a new plan for the improvement of peat, so that this inferior fuel may be utilised as a substitute for lignite during the present coal scarcity in Germany. The Exhibition of Water-power and Energy in Munich opens up new perspectives by the publication of research material of the Gesellschaft für maschinelle Druckentwässerung in Uerdingen am Niederrhein. The process is based on the fact that the peat-colloid can be influenced if a finely divided additional substance is mixed with the raw peat. The material chosen is that available on the spot, namely, the partially dried peat with 30 per cent. of water. In this way a pressed product of 50 to 60 per cent. water-content is produced. This mixed product already shows a reduction of surface tension and a flocky and crumbly condition due to the particles of dry peat. Thenceforward the humus particles become the dispersion medium and water the dispersed phase. The reversibility in the earlier condition extends to a certain water-content, dried turf showing an irreversible alteration of condition. Ultimately the product is pressed into briquettes like lignite. These statements are extracted from an article by Heinrich Caro on "Veredelung minderwertige Brennstoffe nach dem Madruckverfahren" in *Die Naturwissenschaften* for September 16. The process may be valuable to Ireland, and even to England—a strange result of depriving Germany of coal.

UNDER the title "Utilisons la Houille Bleue," *La Nature* for October 29 contains an interesting article by M. H. Lémonon, illustrating a number of the earlier suggestions for developing tidal power by means of mechanisms operated by floats which rise and fall with the tide, or by air which is compressed into a suitable chamber by the rising tide. The article also describes a type of paddle motor in which motion of the paddles is derived from wave impact. While these are of historical interest, none of the methods outlined, nor indeed any such methods, are capable of utilisation on a large scale, and, generally speaking, their capital cost per horse-power of output would be so great as to render them commercially impracticable. The only hope of utilising tidal power on an economic basis would appear to lie in the use of tidal basins, storing water at high tide for use in turbines at periods between high and low tide, and in a following article the author intends to discuss such methods.

A DAM may be constructed across a stream for any one of several purposes, such as city water supply, improvement of navigation, hydraulic power, or flood prevention. If suitably located and operated, a dam primarily intended to produce the head for a power scheme may also be utilised to improve the navigation above the dam, to store water for equalising the power output, for preventing floods, and at the same time improving the dry weather flow below the dam. This multiple effect cannot always be realised, but there are occasions when two or more of these functions may profitably be combined, and in an article in the *New Zealand Journal of Science and Technology*, vol. 4, No. 4, for August, 1921, Mr. A. D. Mead deals with the question of the most economical height of dam and the economic size of reservoir to satisfy the necessary requirements in a number of typical cases.

IN a paper communicated to the Section of Physiology at a recent meeting of the British Medical Association, and briefly reproduced in the *British Medical*

Journal of October 29, Prof. M. C. Potter, of Newcastle, develops his previous researches in which he showed that the fermentation of cane-sugar by yeast develops an electromotive force. He urges that during the photosynthetical production of carbohydrates from CO_2 and water, electrical as well as thermal energy becomes latent, which is liberated again when the carbohydrate is decomposed, *e.g.* in muscular action, when the E.M.F. developed is proportional to the quantity of carbohydrate used. Similarly, from the fact that the carbon dioxide bubbling off from fermenting sugar is ionised, he proposes that the CO_2 coming from the tissues into the blood is in the same state. Measurements of the E.M.F. of the body as a whole gave very varying results.

ANODE rays produced by means of an anode composed of powdered carbon mixed with a halogen salt of the metal to be investigated, may, according to a paper by Mr. G. P. Thomson in the November issue of the *Philosophical Magazine,* be used successfully to determine the isotopes which are present in lithium, and to show that beryllium is apparently single, but they cannot be used to settle the question for the other alkali and alkaline earth elements. The method used is that in which an electrostatic field of the order of 1000 volts per cm., and a magnetic field of the order of 2000 gauss, act at right angles to the initial path of the anode rays, and produce parabolas on a photographic plate. These parabolas show that lithium consists of isotopes of atomic weights 6 and 7, but no trace is shown in any of the experiments of doubly charged or negatively charged metallic atoms. Parabolas due to the gas in the tube, *e.g.* carbon monoxide, water, fluorine, and iodine, were also detected and measured.

Nos. 1 and 2, for March and June last, of *Terrestrial Magnetism and Electricity* have been combined. Nearly half the combined issue is occupied by a paper by the editor, Dr. L. A. Bauer, on measurements of the electric and magnetic activity of the sun and the earth and interpretations. Various measures of solar activity based on areas of sun-spots, prominences, and faculæ are considered and illustrated graphically. Bidlingmaier's formula for the earth's magnetic activity is criticised adversely, and other measures proposed. The absolute daily range of the horizontal force finds most favour with Dr. Bauer. A deduction from observations made on board the surveying ship *Carnegie,* which if confirmed would be of fundamental importance, is that the diurnal variation of atmospheric electricity potential gradient at sea consists chiefly of a single wave, which progresses according to universal—not local—time, the minimum occurring about 4 a.m., the maximum about 7 p.m. Greenwich civil time. A second paper of considerable interest is an abstract in English of a memoir by Mr. L. Steiner, presented to the Hungarian Academy of Sciences in January last, discussing "a special form of magnetic disturbances" shown by the O'Gyalla magnetograms of the years 1906–17. These are of the "bay" type, but the changes in the several elements differ in phase, so that the force vector rotates. Steiner finds that the vector in the horizontal plane usually rotates clockwise in the morning hours and anti-clockwise in the afternoon. His results appear in general agreement with those derived some years ago from disturbances at Greenwich by Mr. R. B. Sangster, of whose work he seems unaware. There is a portrait and obituary notice of the late Dr. E. Leyst, of Moscow, a voluminous writer on terrestrial magnetism.

WE have received two recent issues of the Spanish popular scientific weekly *Ibérica,* which follows somewhat in its make-up the French *La Nature.* It contains scientific notes from Spanish and Latin-American sources and brief, interesting articles on general scientific subjects. The two issues before us contain a description of the radio-therapeutic laboratory at Granada University and of the bio-chemical section of the Faculty of Sciences at Saragossa; an account of the excavations carried out in 1920 at Aliseda (Cáceres) and the discovery of Phœnician relics; also a description of discoveries dating back to the Carthaginian age in Spain (at the Tutúgi necropolis), as well as interesting notes culled from foreign sources. This publication should form a valuable medium for the advertising of British scientific instruments and products in Spain and Portugal. The magazine is published in two editions (a cheap edition, and one on special laid paper), the address of the publishers being Apartado 9, Tortosa.

AT a meeting of the Newcomen Society held at Caxton Hall, Westminster, on November 16, a paper was read by Mr. C. F. Dendy-Marshall on "The Liverpool and Manchester Railway." Though built a few years later than the Stockton and Darlington Railway, the Liverpool and Manchester was the first considerable enterprise in railway engineering, and the date of its formal opening, September 15, 1830, may be regarded as the inauguration of the railway systems of the world. On that day eight trains left Liverpool drawn by eight of Stephenson's engines, among the drivers being George Stephenson, Robert Stephenson, Joseph Locke, Thomas Longridge Gooch, and Frederick Swanwick. The famous trial when Stephenson's "Rocket" beat the "Novelty," "Perseverance," and "Sans Pareil," had taken place a year before, October 6, 1829. Costing about 800,000*l.*, the line was thirty-one miles long and had a double track throughout. Just as Boulton and Watts's works at Birmingham became the training-ground of the early mechanical engineers, so the Liverpool and Manchester Railway was the school in which many of the greatest railway engineers gained their first experience. Mr. Dendy-Marshall not only gave much interesting information regarding the line, but he exhibited a fine collection of prints and illustrations, drawings, medals, china, etc., all of which added greatly to the interest of his paper.

WE have received from Messrs. Watson and Sons (Parker Street, Kingsway, W.C.2) their Bulletins Nos. 37 S and 40 S. The former gives particulars of the "Canny Ryall" portable diathermy apparatus.

It consists of a step-up transformer, condensers, spark-gap, and transformer, and is arranged to work off 100–200, and 200–240 volts alternating currents, with periodicities of 50–60. Bull. 40 S gives a list of second-hand electro-medical apparatus, including X-ray sets and accessories, all of which are guaranteed to be in first-rate working order, and show considerable reductions in price over similar new apparatus.

WE are indebted to a correspondent for the suggestion that the name of Dr. Henry Charlton Bastian, F.R.S., who died on November 17, 1915, should be added to the "Calendar of Scientific Pioneers." Bastian was not only a pioneer in neurology, but was also well known as a supporter of the doctrine of "heterogenesis," and for his investigations regarding the origin of life.

Our Astronomical Column.

THE DECEMBER METEORS.—Mr. W. F. Denning writes:—"This event is anticipated with unusual interest this year on account of the brilliant and abundant display observed in 1920. Early in the morning of December 13 meteors were observed to be falling at the rate of about five per minute, and several observers who were not regular meteoric students were attracted to watch the spectacle on account of its special character. The probability, therefore, that another rich return may take place this year renders it necessary that the sky should be attentively watched from about December 10 to December 13. The meteors are moderately swift and the radiant point is close to the star α Geminorum at the time of maximum, but, like the Perseids of August, the Geminids exhibit a radiant point which moves eastward at the rate of about 1° per day. The shower certainly begins early in December, if not late in November, but there appear to be few traces of it left after the middle of December.

"The Geminids have no cometary connection so far as we know, but it is highly probable that this system had its derivation from a comet which either belongs to a past, or the present, age, and probably having a long period of revolution."

THE ORIGIN OF COMETS.—The question whether the comets of long period belong to the solar system or are visitors from outside has been debated in recent years by many astronomers. Prof. G. Armellini contributes another paper on the subject to the September issue of *Scientia*. He points out the insufficiency for this purpose of the method of special perturbations, since this would have to be carried to an impracticable length before it could decide the character of an orbit at a great distance from the sun. Moreover, some who have used the method have failed to take the origin at the centre of gravity of the solar system, the result of this neglect being an apparent oscillation of the orbit from ellipse to hyperbola in a period of twelve years owing to the displacement of the sun by Jupiter.

Prof. Armellini introduces a new argument in favour of the origin of comets within the solar system, asserting that the combined attraction of the stellar system would tend to give closed orbits even to those comets the paths of which are hyperbolic while near the sun. The stellar attraction would be absolutely negligible in the region of space over which ordinary computations have extended, but might become sensible near the aphelia of the long-period comets. The author appears to assert that the stellar attraction would in all cases reinforce that of the sun; this, however, seems not to be the case. The resultant stellar action would evidently be very nearly constant both in magnitude and direction within the region of space in question; hence it would strengthen the sun's action on one side, but weaken it on the other. Unfortunately, our knowledge of the stellar masses is insufficient to form any estimate of the direction in which the resultant acts.

Prof. Armellini appears to make an illegitimate assumption in treating the stellar action as directly proportional to the distance from the centre of gravity of the star-sphere. This law would hold inside a homogeneous sphere, but not in a sphere where the empty regions enormously exceed those occupied by matter.

OBSERVATIONS OF MARS AT FLAGSTAFF.—The observations of Mars carried on for so many years at Flagstaff, Arizona, by the late Prof. Percival Lowell, are still being continued. This is fortunate, for the climate and the excellent 24-inch refractor by Alvan Clark are both well suited to the work. Bulletin No. 83 of the observatory describes the observations made in 1920 by G. H. Hamilton, and reproduces nine drawings made on dates between March 8 and May 26. These dates converted into the Martian Calendar (N. hemisphere), would correspond with July 8 and August 18.

The interesting feature of the opposition was the unusual number of white markings near the east and west limbs, which generally dispersed, or diminished in size, on the central meridian. As they appeared both over desert and dusky regions, and as the canals could be faintly seen through them, it is concluded that they were cloud or mist rather than ground frost. Even the Syrtis Major, usually so prominent, was sometimes almost lost in mist. From the fact that similar drawings were made in 1903 it is suggested that the phenomenon may occur at the same calendar date in each Martian year, but is clearly visible from the earth only once in fifteen years. Attention is also directed to the fact that these whitish areas are not surrounded by dusky borders, as they would be if the theory were true that explains the canals as the boundaries of regions of different tone, showing up more distinctly from the effect of contrast. The absence of the dusky border also supports the objective reality of the dark border round the polar cap.

It was also noted that some of the dusky regions looked unusually dark after they had been cloud-covered, suggesting growth of vegetation after rain. Altogether the observations support the view that there is more "weather" on Mars than has recently been thought probable. However, Mr. Hamilton quotes some similar observations made by Sir Norman Lockyer in the last century, from which Sir Norman concluded that the seasonal changes of Mars are very intense.